Grade 6 Science
Unit # 1- Physical Science
Topic 3 Energy – 15 Days

Unit Overview: Students make sense of phenomena as they explore the disciplinary core ideas through the lens of crosscutting concepts, such as Systems and System Models, Cause and Effect, and Matter and Energy. Students begin their discovery of the physical world with models and observable phenomena and move to explore the concept of energy and how it is needed to change matter. This leads to the study of thermal energy and heat transfer.

Topic Essential Question: How does energy cause change?

Lessons

- Topic Launch/Quest Kickoff
- Lesson 1 Energy, Motion, Force, and Work
- Lesson 2 Kinetic Energy and Potential Energy
- Lesson 3 Other Forms of Energy
- Lesson 4 Energy Changes and Conservation
- Topic Close –Assessment, Quest Findings

NYSSLS Performance Expectations

MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.] [Assessment Boundary: Assessment could include both qualitative and quantitative evaluations of kinetic energy.]

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

MS-PS3-5. Construct, use, and present an argument to support the claim that when work is done on or by a system, the energy of the system changes as energy is transferred to or from the system. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment could include calculations of work and energy.]

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Topic Opener **PE:** MS-PS3-2; MS-PS3-5 **SEP:** Engaging in Argument from Evidence **DCI:** **PS3.B –** Conservation of Energy and Energy Transfer ● When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) **PS3.C –** Relationship Between Energy and Force ● When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) **CCC:** Cause and Effect; Systems and System Models; Energy and Matter	**Savvas** **Highlighted labs are important to the understanding of the instructional concepts in this lesson and must be completed during Science instructional time.** ● Topic Readiness Test ● *u*Connect Lab – What Would Make A Card Jump? ● Quest Kickoff Video – Outrageous Energy Contraptions ● Quest Kickoff
Lesson 1 – Energy, Motion, Force, and Work **PE:** MS-PS3-5 **SEP:** Constructing Explanations and Designing Solutions **DCI:** **PS3.A –** Definitions of Energy ● Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1) ● A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2) ● (NYSED) Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, phases (states), and amounts of matter present. (MS-PS3-3),(MS-PS3-4) **PS3.B** – Conservation of Energy and Energy Transfer ● When the motion energy of an object changes, there is inevitably some other change in energy at the same time. (MS-PS3-5) **PS 3.C –** Relationship Between Energy and Force ● When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2) **CCC:** Cause and Effect, Energy and Matter	**Savvas** **Guiding Objectives:** ● Students will use text evidence to: define energy, motion, force and work; relate energy to motion and force; determine the relationships among energy, motion, force, and work. ● Students will apply mathematical reasoning in order to calculate: the amount of work done; the amount of power used. **Literacy Connection** ● Determine Central Ideas **Vocabulary** ● energy ● motion ● force ● work ● power **Academic Vocabulary** ● maximum **Connect -** TE/SB p. 90 ● Connect It! ● Poll – Things That Have Energy ● Quest Connection **Investigate -** TE/SB pp. 91-96 ● *u*Investigate Lab – What Work Is ● Video – Energy, Motion, Force, and Work ● Interactivity – Get Moving With Energy ● Interactivity – Understanding Machines ● Reading Checks (pp. 92; 95) ● Math Toolbox ● Literacy Connection **Synthesize -** TE/SB pp. 97-98 ● Interactivity – Force and Energy ● Quest Check-In Interactivity – Applying Energy ● Reading Check (p.98) ● Model It! ● Quest Check-In **Demonstrate** – TE/SB pp. 99 ● Lesson 1 Check ● Lesson Quiz 1

Lesson 2 – Kinetic Energy and Potential Energy

PE: MS-PS3-1; MS-PS3-2

SEP: Developing and Using Models; Analyzing and Interpreting Data

DCI:

PS3.A – Definitions of Energy

- Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)
- A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)
- (NYSED) Temperature is a measure of the average kinetic energy of particles of matter. The relationship between the temperature and the total energy of a system depends on the types, phases (states), and amounts of matter present. (MS-PS3-3),(MS-PS3-4)

PS 3.C – Relationship Between Energy and Force

- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)

CCC: Scale, Proportion, and Quantity; Systems and Systems Model

Savvas

Guiding Objectives:

- Students will use visual representation to identify: factors related to kinetic energy; factors that affect potential energy.
- Students will integrate quantitative information to explain the relationship between potential and kinetic energy.
- Students will evaluate expressions to identify: the linear relationship of gravitational potential energy; the nonlinear relationship of kinetic energy.

Literacy Connection

- Integrate with Visuals

Vocabulary

- kinetic energy
- potential energy
- gravitational potential energy
- elastic potential energy

Academic Vocabulary

- virtue

Connect - TE/SB p. 100

- Connect It!
- Class Discussion: Because of Kinetic Energy or Gravitational Potential Energy
- Quest Connection

Investigate - TE/SB pp. 101-102; 104

- Video – Kinetic Energy and Potential Energy
- *u*Investigate Lab – Mass, Velocity, and Kinetic Energy
- *u*Investigate Lab – Energy, Magnetism, and Electricity
- Interactivity – Interpret Kinetic Energy Graphs
- Virtual Labs – Skate or Fly!
- Reading Check (pp. 102; 105)
- Math Toolbox (pp.102)

Synthesize - TE/SB pp. 103-106

- Interactivity – Racing for Kinetic Energy
- Interactivity: Roller Coasters and Potential Energy
- Literacy Connection
- Quest Check In
- Quest Check-In Lab: Build a Chain-Reaction Machine
- Model It!

Demonstrate – TE/SB p. 106

- Lesson 2 Check
- Lesson 2 Quiz

Lesson 3 – Other Forms of Energy

PE: MS-PS3-5

SEP: Engaging in Argument from Evidence

DCI:

PS3.B – Conservation of Energy and Energy Transfer

- When the motion energy of an object changes, there is inevitably some other change in energy at the same time (MS-PS3-5)

CCC: Energy and Matter

Savvas

Guiding Objectives:

- Students will use scientific reasoning to classify, quantify, and measure different forms of energy.
- Students will use models to represent relationships among different forms of energy.

Literacy Connection

- Cite Textual Evidence

Vocabulary

- mechanical energy
- nuclear energy
- thermal energy
- chemical energy
- electrical energy
- electromagnetic radiation

Academic Vocabulary

- medium

Connect - TE/SB pp. 108

- Connect It!
- Write – Energy Use
- Quest Connection

Investigate - TE/SB pp. 109-113

- *u*Investigate Lab – Making a Flashlight Shine
- Interactivity - Types of Energy
- Interactivity – Forms of Energy
- Video – Nuclear Energy
- Model It!
- Reading Check (pp. 109; 113)
- Question It!
- Literacy Connection

Synthesize - TE/SB pp. 114-116

- Quest Check-In Lab – Test and Evaluate a Chain-Reaction Machine
- Quest Check-In

Demonstrate – TE/SB p.116

- Lesson 3 Check
- Lesson 3 Quiz

Lesson 4 – Energy Change and Conservation

PE: MS-PS3-5
SEP: Engaging in Argument from Evidence
DCI:
PS3.B – Conservation of Energy and Energy Transfer
- When the motion energy of an object changes, there is inevitably some other change in energy at the same time (MS-PS3-5)

CCC: Energy and Matter

Savvas
Guiding Objectives:
- Students will cite textual evidence to explain how energy changes from one form to another.
- Students will use models to demonstrate how energy transfers between objects.
- Students will use proportional relationships to explain how energy is conserved in a system.

Literacy Connection
- Cite Textual Evidence

Vocabulary
- Law of Conservation of Energy

Academic Vocabulary
- pivot

Connect - TE/SB pp. 118
- Connect It!
- Write – Everyday Energy Transformations
- Quest Connection

Investigate - TE/SB pp. 119-123
- *u*Investigate Lab – Law of Conservation of Energy
- Interactivity – Energy Transformations
- Video – Energy Change and Conservation
- Model It!
- Reading Check (p. 121)
- Math Toolbox (p.123)
- Literacy Connection

Synthesize - TE/SB pp. 124-125
- Interactivity – Take it to the Extreme
- Quest Check-In Lab – Redesign and Retest a Chain-Reaction Machine
- Reading Check (p.124)
- Quest Check-In

Demonstrate – TE/SB p.124
- Lesson 4 Check
- Lesson 4 Quiz

Topic Close

- Topic 3 Assessment and Remediation TE/SB pp. 128-131
- Quest Finding and Reflection TE/SB p. 131

CLRI Literacy Connections:

Enrichment: Independent Reading
"Women in Science: Ada Lovelace" by Nick Pierce
Synopsis: "Ada Lovelace's brilliant talent for mathematics and huge imagination helped pave the way for the invention of the computer that powers the world around us. Every time you use a smartphone, you can only do so because of the pioneering work by Ada Lovelace."

Topic 3 Enrichment

Topic 3 - Lesson 1 Enrichment
- Enrichment Activity – How Much Work is Done?

Topic 3 - Lesson 2 Enrichment
- Enrichment Activity – Kinetic or Potential Energy?
- Interactivity – Falling for Velocity

Topic 3 - Lesson 3 Enrichment
- Enrichment Activity – Transformation of Energy
- Career Video – Energy Engineer

Topic 3 – Lesson 4 Enrichment
- Enrichment – The Energy of a Comet
- Case Study – U.S. Energy Consumption

Enrichment: Independent Reading "Secret Engineer – How Emily Roebling Built the Brooklyn Bridge" by Victoria Tentler-Krylov **Synopsis:** Read how Emily Roebling stepped in when Washington Roebling (her husband and Brooklyn Bridge Designer) became too ill to continue working. Her dedication to learning and her husband led her to see through the end of the bridge's construction.	
English Language Learners (ELL) Enhancements To access hyperlinked material, you must be logged into your BPS Google Drive	**Listening** • **Cross- Linguistic Practices:** Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates). • **Activating Prior Knowledge** Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content. • **Visuals** - GIFs, pictures- will assist students in understanding what they are listening to. Use **visual thinking strategies** to set the lens for learning. • Video to review or introduce a topic – use **closed captioning** to help students see the words and pronunciations while they listen to the content. • **Word stretching / Vowel stretching** when instructing allows student to listen closely to the pronunciation of the word. • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening. Scroll for grade 6.
	Speaking • **Sentence Stems/Frames** - to begin a sentence - such as *Evolution is…* or *I think that evolution is…* • **Academic Conversation Starters:** Have a visual of a list of academic sentence starters that students can refer to in a discussion. • **Choral Reading** - To build fluency, self-confidence and motivation with reading/speaking. • Create **movement** to go with the word. Movement can be a motivating factor, as well as a kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning. • **Performance Level Descriptors** This document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of speaking. Scroll for grade 6.
	Reading • Supplementary Text to help reinforce concepts. • **Visual Aids** - Pictures or models to support vocabulary words and concepts • Video to review or introduce a topic - use **closed captioning** to help students read along while they listen to the content. • **4 Square / Frayer models** to help students gain a deeper understanding of vocabulary. • **Highlighting** important text to assist students in answering questions after the reading. • **Chunking**-Break reading of text into chunks or paragraphs • **Vocabulary Morphology**- Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student's vocabulary. • **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grade 6.

	Instructional Accommodations (depending on the student's needs) ● **Extended time** for tests in class, projects and assignments ● **Directions read.** Broken down as necessary ● **Model** how to complete the activity in the lesson ● **Oral simplification** of directions or questions ● **Translated version** of test when available. Student may have both version English and native language version ● Use of **approved bilingual glossaries** from NYS in each subject
Special Education Modifications Special Education students must have accommodations as per Individual Educational Plan (IEP)	**Instructional** ● **Pre-teach** vocabulary ● Use **picture vocabulary** ● Scaffold **Depth of Knowledge** questions ● Provide copy of notes/**notes in "cloze"** form ● Use of **Think, Pair, and Share** strategy to help process information ● **Scaffold** written assignments with the use of **graphic organizers** ● Allow for **multiple ways to respond** (verbal, written, response board) ● Provide **model of performance task** ● **Modify informational text** to fit the needs of the students ● Provide a digital or paper i**nteractive notebook** ● Present complex **tasks in multiple ways** ● Provide **mnemonic strategies** for scientific concepts
	Technology: ● **Audio** reading of text ● **Text to type** functions ● **Videos** to clarify/visualize science concepts ● **Record class lecture/discussions** and make accessible to student ● **Nearpod**- interactive presentations of notes
	In Class Assessments ● Provide **multiple options** for projects ● **Use of timer** in class ● Break all complex tasks into chunks
Step Up to Writing Step Up to Writing Materials can be found in BPS Science K-12 Schoology Folder Grade 6 Resources Grade 6 SUTW materials	● Easy Two-Column Notes ● Breaking Down Definitions ● Paragraph Frame- What I Learned ● **Performance Level Descriptors** this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grade 6.
Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom	● Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications ● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population ● All students are given an opportunity to engage in science discourse ● Teacher demonstrates high expectations for all students